1   1. A method of using an alkali metal vapor cell to determine the modulation index of

2   a frequency-modulated laser source,

3   the method comprising the steps of:

4   modulating the laser source at a given power and a given frequency;

5   passing the laser light from the modulated laser source through the cell; and

6   determining the modulation index of the laser source from the absorption

7   spectrum of the alkali metal vapor.

1   2. The method set forth in claim 1 wherein:

2   the absorption spectrum includes plurality of minima; and

3   the modulation index is determined from the minima.

1   3. The method set forth in claim 2 wherein:

2   a photodetector receives the laser light that passes through the cell; and

3   the minima are measured using the output of the photodetector.

1   4. The method set forth in either claim 2 or claim 3 wherein:

2   in the step of determining the modulation index, the modulation index is

3   determined using ratios of the minima.

1   5. The method set forth in claim 4 wherein:

2   the modulation index is ambiguously determined using a ratio of first ones of

3   the minima and disambiguated using a ratio of second ones of the minima.

1   6. The method set forth in claim 4 wherein:

2   the minima include a primary minimum and a first satellite minimum; and

3   the modulation index is determined using the ratio of the primary minimum

4   and the first satellite minimum.

1   7. The method set forth in claim 6 wherein:

2   the minima include a second satellite minimum and a third satellite minimum;

3   the determination of the modulation index using the ratio of the primary

4   minimum and the first satellite minimum is ambiguous; and

5   in the step of determining the modulation index, the ratio of the second
6   satellite minimum and the third satellite minimum are employed to disambiguate the
7   modulation index determined using the ratio of the primary minimum and the first
8   satellite minimum.

1   8. The method set forth in claim 4 wherein:

2   the minima include a first satellite minimum and a second satellite minimum;
3   and

4   the modulation index is determined using the ratio of the first satellite
5   minimum and the second satellite minimum.

1   9. The method set forth in claim 8 wherein:

2   the minima include a third satellite minimum;

3   the determination of the modulation index using the ratio of the first satellite
4   minimum and the second satellite minimum is ambiguous; and

5   in the step of determining the modulation index, the ratio of the second
6   satellite minimum and the third satellite minimum are employed to disambiguate the
7   modulation index determined using the ratio of the first satellite minimum and the
8   second satellite minimum.

1   10. The method set forth in claim 1 wherein:

2   in the step of modulating the laser source, the given frequency is
3   approximately one half that of the hyperfine separation of the alkali metal vapor in the
4   cell.

1   11. A method of calibrating a frequency-modulated laser source in a CPT frequency
2   standard to run at a desired modulation index, the light from the laser source passing
3   through an alkali metal vapor cell in the CPT frequency source and
4   the method comprising the steps of:
5   1. modulating the laser source at a given power and a given frequency;
6   2. determining the modulation index of the laser source from the absorption
7   spectrum of the alkali metal vapor; and
8   3. repeating steps 1-2 with a different given powers until the determined
9   modulation index is the desired modulation index.

1   12. The method set forth in claim 11 further comprising the step of:

2   operating the laser source thereafter at the given modulation power that

3   produces the desired modulation index.

1   13. The method set forth in claim 12 wherein:

2   the CPT frequency standard automatically performs the method of claim 12.

1   14. The method set forth in claim 13 wherein:

2   the method is performed upon initialization of the CPT frequency standard.

1   15. The method set forth in claim 13 wherein:

2   the method is performed during normal operation of the CPT frequency

3   standard.

1   16. A CPT frequency standard that includes a frequency-modulated laser source and

2   an alkali metal vapor cell,

3   the laser source having been calibrated to operate at a desired modulation index by

4   performing steps comprising:

5   1. modulating the laser source at a given power and a given frequency;

6   2. determining the modulation index of the laser source from the absorption

7   spectrum of the alkali metal vapor; and

8   3. repeating steps 1-2 with different given powers until the determined

9   modulation index is the desired modulation index.

1   17. The method set forth in claim 16 further comprising the step of:

2   operating the laser source thereafter at the given modulation power that

3   produces the desired modulation index.

1   18. The method set forth in claim 17 wherein:

2   the CPT frequency standard automatically performs the method of claim 17.

1   19. The method set forth in claim 18 wherein:

2   the CPT frequency standard automatically performs the method of claim 17
3   upon initialization.

1   **20.** The method set forth in claim 18 wherein:
2   the CPT frequency standard automatically performs the method of claim 17
3   during normal operation.

1   **21.** A CPT frequency standard comprising:
2   a frequency-modulated current source for a laser;
3   an alkali metal vapor cell through which light from the laser passes; and
4   a control processor that receives a digitized signal that indicates variations in
5   the amount of light which is transmitted by the vapor cell,
6   the control processor determining a current modulation index from the digitized signal
7   and controlling the power of the frequency modulation in the current source to
8   produce the desired modulation index.

1   **22.** The CPT frequency standard set forth in claim 21 wherein:
2   the control processor controls the power of the frequency modulation in the
3   current source to produce the desired modulation index upon initialization of the CPT
4   frequency standard.

1   **23.** The CPT frequency standard set forth in claim 21 wherein:
2   the control processor controls the power of the frequency modulation in the
3   current source to produce the desired modulation index during normal operation of the
4   CPT frequency standard.